

point greater than about 50°C and less than about 110°C and represented by the formula $C_yH_{2y+1}COC_zH_{2z+1}$, wherein y and z are 1 or greater and y+z is at most 5, and chlorocarbon extractive agents consisting of chlorocarbons having a normal boiling point greater than about 39°C and less than about 150°C and represented by the formula $C_sH_{2s+2-t}Cl_t$, wherein s is 1 or 2 and t is from 2 to 4 to form a second mixture,

separating difluoromethane (HFC-32) from at least one halocarbon of the second mixture by extractively distilling the second mixture, and

recovering difluoromethane (HFC-32) substantially free of at least one halocarbon, with the proviso that when the halocarbon is pentafluoroethane (HFC-125), the chlorocarbon extractive agent may not be methylene chloride and when the halocarbon is 1,1,1-trifluoroethane (HFC-143a), the extractive agent may not be an alcohol.

REMARKS

By the present amendment, claim 1 has been amended. The claims now pending are 1-11. A marked-up version of the rewritten claims is attached as a separate page to this amendment and is titled "Version With Markings to Show Changes Made". Reconsideration and favorable action are respectfully requested.

RE: Examiner's statement in the March 27, 2001 office action "This application does not contain an abstract of the disclosure as required by 37 CFR 1.72(b). An abstract on a separate sheet is required."

An abstract on a separate sheet is submitted herewith.

RE: Examiner's statement in the March 27, 2001 office action "The compound "chlorodifluoromethane" in claim 1, line 3 is abbreviated as (CFC-12) which appears to be inconsistent with the specification..."

The term "chlorodifluoromethane" in claim 1 has been amended to read dichlorodifluoromethane, consistent with the specification's teaching at: page 3, lines 24 and 29; page 5, table 1; page 8, table 5; page 10, line 13; page 11, lines 12 and 31; examples 1 and 2; as well as numerous other places in the specification.

The one other errant occurrence of the term "chlorodifluoromethane" in the specification has been amended to dichlorodifluoromethane (at page 2, line 22).

Rejections under 35 U.S.C. 112

RE: "A) the "comprising" recited in the Markush grouping of claim 1, lines 10, 13 and 19 constitutes an improper Markush language"

Claim 1 has been amended. The cited occurrences of the term "comprising" has been replaced with the term "consisting of".

RE: "B) Claim 5 is at odds with claim 1, the claim from which it depends. "

Claim 1 states "...with the proviso that when the halocarbon is pentafluoroethane (HFC-125), the chlorocarbon extractive agent may not be methylene chloride...". The limitation of claim 5 does not remove this proviso and is, therefore, not at odds with Claim 1.

Rejections under 35 U.S.C. 102(e) and 35 U.S.C. 103(a)

RE: "Claims 1 and 4 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Mahler et al."

Mahler et al. is US patent no. 5,830,325. Claim 1 has been amended to exclude the subject matter of Mahler. Mahler only describes alcohols as an extractant in the separation of HFC-143a from impurities. The instant invention is a different process from Mahler and uses extractants not disclosed in Mahler. Relative volatilities of the combination of HFC-32 with halocarbons is not predictable. Therefore, Mahler neither discloses nor suggests the instant invention.

RE: "Claims 1 - 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mahler et al in view of EP '362."

EP'362 discloses separation of pentafluoroethane from chloropentafluoroethane and does not disclose relative volatilities between HFC-32 and the present halocarbons in the presence of the claimed extractive agents. Relative volatilities of the combination of HFC-32 with halocarbons are not predictable and would be required for one of ordinary skill in the art to determine whether a specific extractant will perform a desired separation. Therefore, neither Mahler alone nor in combination with EP'362 suggest the instant invention.

RE: "Claims 1 - 5 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Miller."

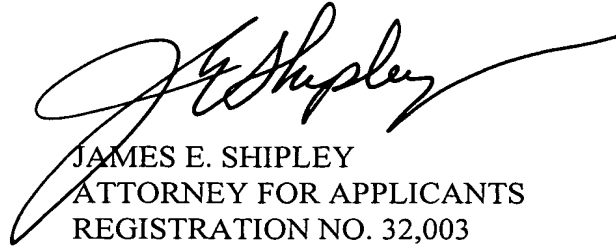
The instant claims exclude what is disclosed in Miller. In addition, the presently claimed invention is not obvious for the reasons already stated above for Mahler.

In addition, Application Serial No. 09/485,559 and Patent No. 6,156,161 were, at the time the invention of Application Serial No. 09/485,559 was made, owned by the same E. I. DuPont de Nemours and Company, Inc.

Therefore, Application Serial No. 09/485,559 is disqualified from being used in a rejection under 35 U.S.C. 103 against the instant claims.

In view of the foregoing, allowance of the above-referenced application is respectfully requested.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "J. E. Shipley", written over the printed name and title.

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9/27/01
Date

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In showing the changes, deleted material is shown as bracketed (e.g. [bracketed]), and inserted material is shown as underlined (e.g. underlined).

In the claims:

Claim 1 has been amended as follows:

1.(Amended) A process for separating difluoromethane (HFC-32) from at least one halocarbon of a first mixture comprising difluoromethane (HFC-32) and halocarbon selected from the group consisting of dichlorodifluoromethane (CFC-12), 1,1,1-trifluoroethane (HFC-143a), chloropentafluoroethane (CFC-115), and pentafluoroethane (HFC-125), comprising the steps of:

contacting the first mixture with an extractive agent selected from the group consisting of:

hydrocarbon extractive agents [comprising]consisting of hydrocarbons having from 5 to 9 carbon atoms and having a normal boiling point greater than about 30°C and less than about 155°C,

oxygen-containing extractive agents [comprising]consisting of alcohols having a normal boiling point greater than about 60°C and less than about 100°C and represented by the formula $C_xH_{2x+1}OH$, wherein x is from 1 to 3, and ketones having a normal boiling point greater than about 50°C and less than about 110°C and represented by the formula $C_yH_{2y+1}COC_zH_{2z+1}$, wherein y and z are 1 or greater and y+z is at most 5, and

chlorocarbon extractive agents [comprising]consisting of chlorocarbons having a normal boiling point greater than about 39°C and less than about 150°C and represented by the formula $C_sH_{2s+2-t}Cl_t$, wherein s is 1 or 2 and t is from 2 to 4 to form a second mixture,

separating difluoromethane (HFC-32) from at least one halocarbon of the second mixture by extractively distilling the second mixture, and

recovering difluoromethane (HFC-32) substantially free of at least one halocarbon, with the proviso that when the halocarbon is pentafluoroethane (HFC-125), the chlorocarbon extractive agent may not be methylene chloride and when the halocarbon is 1,1,1-trifluoroethane (HFC-143a), the extractive agent may not be an alcohol.